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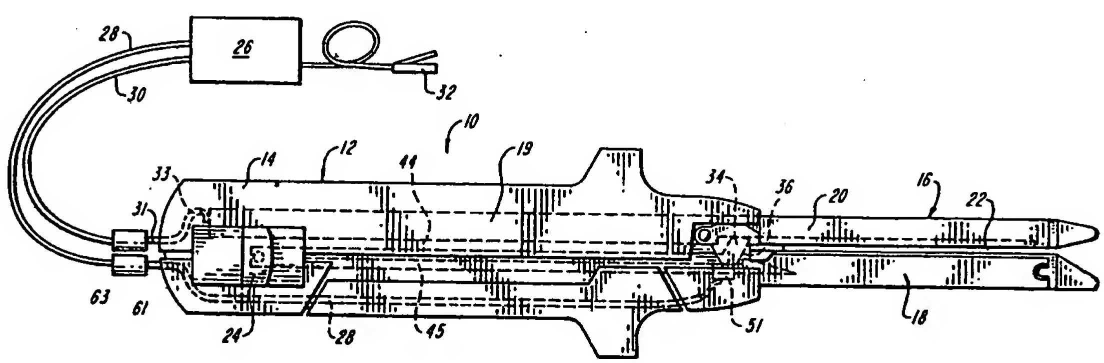

(57) Abstract

An electrosurgical tool (10) comprises a retractable cutting blade (34) movable along a linear cutting path and an electrical energy supply source (26) which communicates electrical energy (e.g. radio frequency energy) through the cutting blade (34) and to tissue adjacent the cutting blade. During surgical procedures the electrosurgical cutting device (10) is able to simultaneously cut tissue and cauterize, or fuse, the tissue in areas adjacent the incision through the application of electrical energy. The effect is a reduced amount of bleeding associated with surgical procedures and an enhanced ability to control and eliminate bleeding. Optionally, the electrosurgical cutting device (10) may also include a supply of surgical staples (38) which are deployed simultaneously with the cutting action and delivery of electrosurgical energy to adjacent tissue.

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ELECTROSURGICAL CUTTING TOOL

Background of the Invention

The present invention relates to an electrosurgical tool which is adapted to simultaneously cut, fuse, and cauterize the cut tissue so as to improve hemostasis.

Surgical procedures often require incisions to be made in internal organs, such as the intestine, causing profuse bleeding at the site of the incision. Prompt control or elimination of the bleeding is of paramount importance to the success and safety of the procedure.

Currently known surgical cutting devices utilize different techniques to control or eliminate bleeding. One known device is the Proximate Linear Cutter available from the Ethicon, Inc. of Sommerville, New Jersey. This device is specifically adapted to make an incision in tissue or an organ such as the intestine. The device engages a portion of the tissue or organ between two tyne-like members. To effect cutting, a blade mounted on one of the tynes travels along a predetermined path, thereby making a linear incision through the tissue or organ. Simultaneously, surgical staples are deployed by the cutting device on either side of the incision, resulting in the separation of the organ

into two segments, each of which is sealed adjacent to the incision by surgical staples. Despite the use of surgical staples and the precise cutting of the tissue, bleeding is not entirely eliminated and separate cauterization procedures must often be utilized to control or stop bleeding.

Surgical devices also are known which utilize electrical current in the form of radio frequency (RF) energy to cauterize tissue and to prevent or control bleeding. U.S. Patent No. 4,651,734 discloses a surgical scalpel modified to include an electrode. This scalpel has the ability to cut tissue and, when properly positioned, to cauterize tissue following a cutting procedure. Such a surgical tool is useful but does not simultaneously cut and cauterize tissue. The separate cauterization procedure which must be utilized is relatively time consuming and may result in unnecessary bleeding. Moreover, such a scalpel is not well suited to many surgical procedures such as the transection of the intestine.

Accordingly, there is a need for a surgical tool which conveniently and safely enables precise incisions to be made in internal organs, and which simultaneously is able to eliminate essentially all bleeding which results from the incision.

It is thus an object of the invention to provide a surgical tool which has improved cutting capability and which decreases some of the risk associated with surgery by minimizing the amount of

bleeding resulting from incisions. Another object is to provide a surgical tool which is adapted to simultaneously cut tissue and to cauterize the cut tissue. A further object is to provide an electrosurgical tool which is specifically adapted to make linear incisions in internal organs and, simultaneously, to fuse the tissue adjacent to the incision in order to eliminate any associated bleeding. Other objects of the invention will be apparent upon reading the disclosure which follows.

Summary of the Invention

The present invention comprises an electrosurgical cutting tool which is able to effect a precise incision through tissue, while at the same time ensuring that essentially all of the bleeding which results from the incision is controlled or eliminated. The electrosurgical cutting tool features a housing which includes a handle portion and a cutting template element which is disposed adjacent to the handle portion of the housing. The cutting template preferably includes first and second elongate tyne elements which define a tissue engaging space. A first tyne element includes a retractable cutting blade which is adapted to travel along a linear cutting path defined within the first tyne. The cutting blade is electrically insulated from the remainder of the tool and is in electrical communication with an active electrode which provides a source of electrosurgical energy to the blade. The surgical cutting tool of the invention also includes a mechanism, preferably located on the handle, which controls the movement of the blade along the cutting path.

The electrosurgical cutting tool may be a bipolar device or a monopolar device. In the preferred bipolar configuration an active electrode supplies electrical current to the blade, and a return electrode is disposed on a tissue-contacting portion of the second tyne. A return electrode is not integrally associated with the tool when it is configured as a monopolar device. Instead, a ground plate, remote from the tool itself, is positioned to contact a portion of the patient's body.

The electrosurgical energy provided to the cutting blade, preferably in the form of radio frequency energy, improves the mechanical cutting ability of the blade, and more importantly, facilitates cauterization and/or fusion of the tissue following the incision. It has been found that the use of radio frequency energy in connection with the cutting tool effectively allows the simultaneous cutting of tissue, and cauterizing and fusing of tissue adjacent the incision in order to eliminate virtually all resulting bleeding.

In another embodiment of the invention a plurality of surgical staples may be deployed by the device during a cutting procedure. In this embodiment a surgical staple cartridge is disposed within the first tyne, defining a central longitudinal groove through which the cutting blade is able to travel. The surgical staple cartridge includes a plurality of staples, preferably disposed in dual rows on either side of the longitudinal groove. Upon movement of the blade, a staple

ejecting device travels with the blade along the length of the staple cartridge causing the staples to be deployed through the tissue. A staple closing mandrel preferably is disposed in the second tyne to effect closure of the staples. This embodiment is advantageous as it allows the tissue to be cut, and at the same time, enables a row of staples to be deployed adjacent the incision while electrical current is passed through the blade to eliminate bleeding by effecting cauterization and tissue fusion. In some instances it may be desirable to deliver electrosurgical energy through the surgical staples as well as through the blade.

Brief Description of the Drawings

Figure 1 schematically illustrates the surgical cutting tool of the invention, including a supply source of electrosurgical energy.

Figure 2 is an exploded side view of the electrosurgical cutting tool illustrated in Figure 1.

Figure 3 is a sectional view of the electrosurgical tool of Figure 2 at lines A-A.

Figure 4 is a sectional view of the electrosurgical tool of Figure 2, at lines B-B.

Figure 5 is a sectional view of the electrosurgical tool of Figure 2 at lines B-B in an embodiment which does not include a surgical staple cartridge.

Detailed Description of the Invention

Figures 1 and 2 illustrate one embodiment of the invention in which the surgical cutting tool 10 comprises a housing 12 including a handle portion 14. Adjacent handle portion 14 is cutting template element 16 which includes a first tyne 18 and a second tyne 20. The two tynes 18, 20 of cutting template element 16 are substantially parallel and define a tissue engaging space 22 into which is inserted the tissue or organ to be incised. In a preferred embodiment, the surgical tool 10 includes a lever 24 which facilitates the movement of a cutting blade 34 along a predetermined path.

Figure 1 further illustrates an electrosurgical generator 26 which serves as an energy source from which electrical current, preferably in the radio frequency range, is communicated to the cutting tool through insulated wire 28. Insulated wire 30 communicates through connector 31 and internal ground wire 33 with a conductive portion of tyne 20 which serves as a ground. A control switch 32, preferably in the form of a foot petal, may be used to control the power supplied to the cutting tool. Alternatively, a control switch may be disposed on a portion of the cutting tool such as the housing 12.

As best shown in Figures 1 and 3, blade 34 can be retracted when not in use. In the retracted position blade 34 is disposed rearward of the first tyne 18 within a forward portion of housing 12.

Blade 34 includes a cutting edge 36 disposed at the leading edge of the blade. Further, a blade actuation arm 44 which extends into housing 12 is either attached to or integral with blade 34. The blade 34 is adapted to move along the longitudinal axis x of the tyne 18 upon actuation of lever 24 in order to effect the cutting of tissue.

A surgical staple cartridge 38 may optionally be seated within the first tyne 18, as illustrated in Figures 1 through 3. Cartridge 38 is adapted to securely fit within a channel 39 formed in tyne 18. The staple cartridge 38 includes a central cutting groove 40 through which the cutting blade 34 passes during a cutting procedure. Dual rows of openings 42 through which surgical staples (not shown) emerge straddle either side of groove 40.

As further illustrated in Figures 1 and 3, lever 24 preferably is connected to the blade 34 through an actuation arm 44. Forward movement of lever 24 thus effects movement of the blade 34 causing it to traverse the cutting groove 40. Preferably, a staple ejecting mechanism, such as ejection arms 45, is actuated simultaneous with actuation of the blade. In this way staples are ejected through openings 42 as the blade traverses the groove 40. As shown in the illustrated embodiment lever 24 may be connected to ejection arms 45 such that movement of the lever 24 also controls movement of the ejection arms 45.

Figure 5 illustrates an embodiment of the invention in which the electrosurgical cutting tool does not utilize surgical staples. In this embodiment the tissue contacting surface 41 of tyne 18 is constructed of or coated with a non-conducting material, such as a suitable polymer. Surface 41 defines a cutting groove 43 through which blade 34 travels when it effects a cutting procedure.

As shown in Figure 4, tyne 20 is secured within housing segment 12a which preferably is detachable from housing segment 12b associated with tyne 18. Further, tyne 20 has a tissue-contacting surface 48 which faces first tyne 18. A central groove 52 is formed in surface 48, superimposable with cutting grooves 40 or 43 of tyne 18, to facilitate movement of the blade along longitudinal axis x.

In an embodiment in which surgical staples are to be deployed simultaneously with a cutting procedure, staple cartridge 38 is present within tyne 18. In addition, surface 48 of tyne 20 includes a mandrel with a plurality staple-closing depressions 50 which correspond to the openings 42 in staple cartridge 38. Preferably, dual rows of depressions are disposed on either side of groove 52. In an embodiment in which a staple cartridge is not utilized, the surface 48 may be substantially smooth and absent depressions 50. In either embodiment, however, surface 48 of tyne 20 should be made of a conductive material so that it may serve as a return electrode for electrical energy delivered through the cutting blade.

In some instances, it may be desirable to apply electrosurgical energy through the surgical staples as well as through blade 34. One skilled in the art could easily modify the electrosurgical surgical tool described herein by connecting internal wire 28 to the staple ejection arms 45 as well as to the blade 34.

Figures 1 through 5 illustrate the connection of the cutting tool 10 to electrosurgical generator 26. As illustrated, an inner wire 28 extends between conductive bushing 51 and electrical connector 61 which protrudes from housing 12. Insulated wire 28 may be attached to electrical connector 61 through connector 63. Bushing 51 communicates electrical current from the generator 26 to blade 34, directly or through blade actuation arm 44. In a preferred embodiment arm 44 and blade 34 are able to slide within bushing 51 while maintaining electrical contact therewith.

In a preferred embodiment, the electrosurgical cutting tool 10 of the invention comprises a bipolar cutting tool in which the cutting blade 34 is electrically isolated from the remainder of the tool and serves as an electrode to deliver electrosurgical energy to the tissue. In this embodiment tyne 20 serves as the return or ground electrode. In other embodiments, it is possible that the surgical tool may comprise a monopolar tool in which electrosurgical energy is delivered through the cutting blade 34, and a separate ground plate (not shown) serves as the return electrode.

In the preferred bipolar mode surface 48 of tyne 20 serves as a ground electrode. Accordingly, exterior ground wire 30 communicates with internal ground wire 33 through connector 31. Internal ground wire 33, in turn, is in electrical communication with a conductive internal anchoring component 19 of tyne 20. Where the cutting device is used in the monopolar mode, external ground wire 30 should not communicate with tyne 20, and the tissue contacting surface 48 of tyne 20 should be made from or coated with a non-conductive material.

As noted above, generator 26 supplies electrosurgical energy to the cutting blade. Virtually any generator which provides electrosurgical energy for medical applications may be used with the present invention. Preferably, the generator is a voltage determinative, low source impedance generator which provides radio frequency energy. Preferably, a suitable generator can supply up to 2 amps of current and has an impedance value of less than 10 ohms.

The energy supplied by generator 26 to the electrosurgical cutting device is preferably in the radio frequency range. Although virtually any frequency in the RF range may be supplied to the cutting device, the preferred frequency range is about 500 to 700 KHz, and most preferably about 550 KHz.

The energy requirements of the electrosurgical tool of the present invention are dynamic and depend to a great extent upon the impedance values of the tissue encountered by the blade during cutting procedures. The impedance of tissue varies among tissue types and the amount of blood present in or around the tissue. The amount of current delivered by the tool to the tissue is a function of the impedance of the tissue. Where tissue contacted has a lower impedance value, more current will be delivered to the tissue by the blade, and, conversely, less current will be delivered to tissue having a higher impedance value. Generally, the amount of current delivered to tissue ranges between about 0.5 and 2.0 amps. The voltage applied to the tissue between the blade and the return electrode typically is between about 50 to 100 volts rms.

The surgical tool of the present invention is particularly well adapted for use in surgical procedures which require transection of an organ such as the intestine. In operation, the tissue (e.g., intestine) is placed within space 22 defined by tynes 18 and 20. The blade is moved forward along the longitudinal axis x of tynes 18 and 20 by movement of lever 24. As the blade moves forward, it passes through the tissue causing it to be severed. Simultaneously, electrical energy (e.g., radio frequency energy), which may be activated for example by foot switch 32, is delivered to the tool. The electrosurgical current is communicated from the blade 34 to the tissue adjacent the blade and in the vicinity of the incision.

During a cutting procedure the blade should be actuated such that it requires approximately 1.5 to 4.5 seconds to move along its predetermined path to sever tissue. Current should be delivered through the blade to the tissue during the entire cutting procedure.

The application of electrical energy in this manner provides two advantages. Electrosurgical energy is delivered through the blade to adjacent tissue to allow for more effective cutting action, and to promote cauterization and/or tissue fusion which effectively eliminates all or substantially all bleeding which results from the incision. The cauterization and/or fusion effect imparted to tissue minimizes blood loss and increases the safety of the surgical procedure as cauterization occurs at substantially the same time that the incision is made.

In a preferred embodiment of the invention, the electrosurgical tool also includes a staple cartridge 38 which houses a supply of surgical staples to be supplied adjacent the incision. The staples may be deployed in one or more linear rows on either side of the incision to assist in closing the incision and sealing the severed end of the organ. The staples are deployed simultaneously with the cutting action of the blade and the tissue fusion effect imparted by the electrical energy.

One skilled in the art will appreciated that a variety of materials are well suited for the manufacture of the electrosurgical tool of this invention. For example, housing 12 and cartridge 38 may be made from or coated with various non-conducting polymers. The conductive components of the tool may be made of various metals, including surgical grade stainless steel and aluminum.

Although the invention is described with respect to the cutting tool illustrated in Figures 1 through 5, it is understood that various modifications may be made to the illustrated electrosurgical cutting device without departing from the scope of the invention. For example, a variety of blade actuation mechanisms may be used. Also, it is not necessary that tynes 18 and 20 take on the shape and orientation illustrated in the drawings. Moreover, the electrical connection between the generator may be made in ways other than those illustrated and described herein. Thus, the present invention is potentially applicable to virtually all electrosurgical cutting devices in which a cutting blade, moveable along a predetermined path, provides electrosurgical energy to incised tissue simultaneously with the cutting of tissue.

What is claimed is:

1. An electrosurgical cutting device, comprising:

a tool housing including a handle portion;

a cutting element, adjacent the handle portion, having substantially parallel first and second elongate tyne elements which define a tissue engaging space therebetween;

a pathway within the first tyne member which defines a cutting path;

a moveable cutting blade, electrically isolated from the remainder of the tool, said cutting blade being adapted to move from a retracted position, through the pathway in the first tyne to sever tissue;

means for moving the cutting blade through the pathway to effect cutting of tissue; and

selectively operable electrosurgical current supply means for communicating electrical energy through the cutting blade to tissue to cauterize tissue simultaneous with the cutting action of the blade.

2. The device of claim 1 further comprising a ground electrode in electrical communication with the second tyne element, forming a bipolar electrosurgical cutting device.

3. The device of claim 2 wherein the second tyne further comprises a longitudinal pathway which cooperates with the longitudinal pathway of the first tyne to define a cutting pathway for the blade.

4. The device of claim 1, further comprising:

a cartridge means for housing a plurality of surgical staples, said cartridge means disposed on the first tyne member, on a side thereof facing the second tyne member and having a longitudinal groove therein to accommodate passage of the cutting blade;

a means for deploying the staples substantially simultaneously with the cutting action of the blade; and

mandrel means for effecting closure of the staples, the mandrel means being disposed on a side of the second tyne member facing the first tyne member.

5. The device of claim 4 wherein the cartridge means contains dual, linear rows of staple ejection ports disposed on opposite sides of the groove, with surgical staples positioned to be ejected from the ports.

6. The device of claim 4 wherein a ground electrode is in electrical communication with the mandrel means, forming a bipolar electrosurgical device.

7. The device of claim 6 wherein the mandrel means further comprises a longitudinal groove which cooperates with the longitudinal groove of the cartridge means to accommodate passage of the cutting blade.

8. The device of claim 7 wherein the electrical current supply means comprises a conducting electrical wire which communicates electrosurgical energy from a generator to the cutting blade.

9. The device of claim 8 wherein the conducting wire communicates with the blade through a conductive bushing in electrical contact with the blade.

10. The device of claim 7 wherein the electrosurgical energy communicated to the tool is in the radio frequency range.

11. The device of claim 8 wherein the generator is voltage determinative, low impedance electrosurgical generator which supplies electrosurgical energy in the range of 500 to 700 KHz.

12. The device of claim 1 wherein the current of the electrosurgical energy delivered to tissue from the cutting bade is in the range of about 0.5 to 2.0 amps.

13. The device of claim 1 wherein the voltage of the electrosurgical energy delivered to the tissue from the cutting blade is in the range of about 50 to 100 volts RMS.

14. An electrosurgical cutting device, comprising;

a handle means for grasping and manipulating the device;

a cutting portion adjacent to the handle means;

a cutting blade moveable along a cutting path within the cutting portion of the device, the cutting blade being electrically isolated from the remainder of the device and being in electrical communication with a remote generator which provides electrosurgical energy to the blade for delivery to tissue contacted by the blade;

a return electrode associated with a tissue-contacting region of the cutting portion electrically isolated from the cutting blade;

lever means for effecting the movement of the blade along a cutting path within the cutting portion of the device; and

power control means for activating and regulating the electrosurgical energy supplied to the tool.

15. The device of claim 14 wherein the cutting portion comprises substantially parallel tyne elements which extend from the housing means and have a tissue-engaging space therebetween.

16. The device of claim 15 wherein a first tyne element houses the cutting blade and a second tyne element serves as the return electrode.

17. The device of claim 16 wherein a cartridge means for housing a supply of surgical staples is disposed within the first tyne element.

18. The device of claim 17 wherein the lever means further controls the action of a staple ejecting mechanism such that surgical staples are deployed substantially simultaneously with the cutting movement of the blade.

19. The device of claim 18 wherein a means for closing the surgical staples is disposed on the second tyne element.

20. The device of claim 14 wherein the electrosurgical energy supplied by the generator is in the range of about 500 - 700 KHz.

21. The device of claim 14 wherein the current of the electrosurgical energy delivered to tissue through the cutting blade is in the range of about 0.5 to 2.0 amps.

22. The device of claim 14 wherein the voltage of the electrosurgical energy delivered to tissue through the cutting blade is in the range of about 50 to 10 volts RMS.

23. A method of conducting electrosurgical procedures, comprising the steps of:

providing an electrosurgical cutting tool having a retractable blade selectively moveable along a predetermined cutting path, said cutting blade being connected to one pole of a bipolar generator and being electrically insulated from the remainder of the tool;

placing tissue in the cutting path of the cutting blade;

activating the cutting blade such that it passes through and severs the tissue;

providing electrosurgical energy through the cutting blade to tissue adjacent the incision simultaneously with the severing of tissue by the blade such that the affected tissue is cauterized and bleeding associated with the incision is essentially eliminated.

24. The method of claim 23 further comprising the step of deploying a plurality of surgical staples adjacent the incision, simultaneous with the steps of activating the cutting blade and providing electrosurgical energy through the blade to the tissue.

25. The method of claim 24 wherein the current of the electrosurgical energy delivered to tissue through the cutting blade is in the range of 0.5 to 2.0 amps.

26. The method of claim 24 wherein the voltage of the electrosurgical energy delivered to tissue through the cutting blade is in the range of about 50 to 100 volts RMS.

27. The method of claim 24 wherein the time required fo the blade to traverse, cut and cauterize tissue is about 1.5 to 4.5 seconds

AMENDED CLAIMS

[received by the International Bureau on 22 March 1993 (22.03.93); original claims 2 and 6 deleted; original claims 1,3,7,14,16,17, 19 and 23 amended; new claims 28 and 29 added; remaining claims unchanged (7 pages)]

1. (Amended) An electrosurgical cutting device, comprising:

a tool housing including a handle portion;

a cutting element, adjacent the handle portion, having substantially parallel first and second elongate tyne elements which define a tissue engaging space therebetween;

a pathway within the first tyne member which defines a cutting path;

a moveable cutting blade, electrically isolated from the remainder of the tool, said cutting blade being adapted to move from a retracted position, through the pathway in the first tyne to sever tissue;

means for moving the cutting blade through the pathway to effect cutting of tissue;

selectively operable electrosurgical current supply means for communicating electrical energy through the cutting blade to tissue to cauterize tissue simultaneous with the cutting action of the blade; and

a return electrode in electrical communication with the second tyne element and electrically isolated from the cutting blade, forming a bipolar electrosurgical instrument.

2. Cancelled.

3. (Amended) The device of claim 1 wherein the second tyne further comprises a longitudinal pathway which cooperates with the longitudinal pathway of the first tyne to define a cutting pathway for the blade.

4. The device of claim 1, further comprising:

a cartridge means for housing a plurality of surgical staples, said cartridge means disposed on the first tyne member, on a side thereof facing the second tyne member and having a longitudinal groove therein to accommodate passage of the cutting blade;

a means for deploying the staples substantially simultaneously with the cutting action of the blade; and

mandrel means for effecting closure of the staples, the mandrel means being disposed on a side of the second tyne member facing the first tyne member.

5. The device of claim 4 wherein the cartridge means contains dual, linear rows of staple ejection ports disposed on opposite sides of the groove, with surgical staples positioned to be ejected from the ports.

6. Cancelled.

7. (Amended) The device of claim 5 wherein the mandrel means further comprises a longitudinal groove which cooperates with the longitudinal groove of the cartridge means to accommodate passage of the cutting blade.

8. The device of claim 7 wherein the electrical current supply means comprises a conducting electrical wire which communicates electrosurgical energy from a generator to the cutting blade.

9. The device of claim 8 wherein the conducting wire communicates with the blade through a conductive busing in electrical contact with the blade.

10. The device of claim 7 wherein the electrosurgical energy communicated to the tool is in the radio frequency range.

11. The device of claim 8 wherein the generator is voltage determinative, low impedance electrosurgical generator which supplies electrosurgical energy in the range of 500 to 700 KHz.

12. The device of claim 1 wherein the current of the electrosurgical energy delivered to tissue from the cutting bade is in the range of about 0.5 to 2.0 amps.

13. The device of claim 1 wherein the voltage of the electrosurgical energy delivered to the tissue from the cutting blade is in the range of about 50 to 100 volts RMS.

14. (Amended) An electrosurgical cutting device, comprising;

a handle means for grasping and manipulating the device;

a cutting portion, adjacent to the handle means, having substantially parallel first and second elements that define a tissue engaging space therebetween;

a cutting blade disposed within the cutting portion of the device and adapted to be manipulated to sever tissue, the cutting blade being electrically isolated from the remainder of the device and being in electrical communication with a remote generator which provides electrosurgical energy to the blade for delivery to tissue contacted by the blade;

a return electrode associated with a tissue-contacting region of the cutting portion electrically isolated from the cutting blade;

lever means for effecting the movement of the blade within the cutting portion of the device to sever tissue; and

power control means for activating and regulating the electrosurgical energy supplied to the tool.

15. The device of claim 14 wherein the cutting portion comprises substantially parallel tyne elements which extend from the housing means and have a tissue-engaging space therebetween.

16. (Amended) The device of claim 14 wherein the first element houses the cutting blade and the second element serves as the return electrode.

17. (Amended) The device of claim 16 wherein a cartridge means for housing a supply of surgical staples is disposed within the first element.

18. The device of claim 17 wherein the lever means further controls the action of a staple ejecting mechanism such that surgical staples are deployed substantially simultaneously with the cutting movement of the blade.

19. (Amended) The device of claim 18 wherein a means for closing the surgical staples is disposed on the second element.

20. The device of claim 14 wherein the electrosurgical energy supplied by the generator is in the range of about 500 - 700 KHz.

21. The device of claim 14 wherein the current of the electrosurgical energy delivered to tissue through the cutting blade is in the range of about 0.5 to 2.0 amps.

22. The device of claim 14 wherein the voltage of the electrosurgical energy delivered to tissue through the cutting blade is in the range of about 50 to 10 volts RMS.

23. (Amended) A method of conducting electrosurgical procedures, comprising the steps of:

providing a bipolar electrosurgical cutting tool having as an active, energy delivering electrode a retractable blade selectively moveable along a predetermined cutting path, said cutting blade being connected to one pole of a bipolar generator and being electrically insulated from a return electrode disposed on the tool and adjacent the blade;

28. (New) An electrosurgical cutting device, comprising:

a tool housing including a handle portion;

a cutting element, adjacent the handle portion, having substantially parallel first and second elongate tyne elements which define a tissue engaging space therebetween;

a pathway within the first tyne member which defines a cutting path;

a moveable cutting blade, electrically isolated from the remainder of the tool, said cutting blade being adapted to move from a retracted position through the pathway in the first tyne to sever tissue;

means for moving the cutting blade through the pathway to effect cutting of tissue;

a cartridge means for housing a plurality of surgical staples, said cartridge means disposed on the first tyne member, on a side thereof facing the second tyne member and having a longitudinal groove therein to accommodate passage of the cutting blade;

a means for deploying the staples substantially simultaneously with the cutting action of the blade;

mandrel means for effecting closure of the staples, the mandrel means being disposed on a side of the second tyne member facing the first tyne member; and

selectively operable electrosurgical current supply means for communicating electrical energy through the cutting blade to tissue to cauterize tissue simultaneous with the cutting action of the blade.

29. (New) An electrosurgical cutting device, comprising:

a tool housing including a handle portion;

a cutting portion, adjacent the handle portion, having substantially parallel first and second elongate tyne elements which define a tissue engaging space therebetween;

a pathway within the first tyne member which defines a cutting path;

a moveable cutting element, electrically isolated from the remainder of the tool, said cutting element being adapted to move from a retracted position through the pathway in the first tyne to sever tissue;

means for moving the cutting element through the pathway to effect cutting of tissue;

selectively operable electrosurgical current supply means for communicating electrical energy through the cutting element to tissue to cauterize tissue simultaneous with the cutting action of the element; and

a ground electrode in electrical communication with the second tyne element and electrically isolated from the cutting blade, forming a bipolar electrosurgical cutting device.

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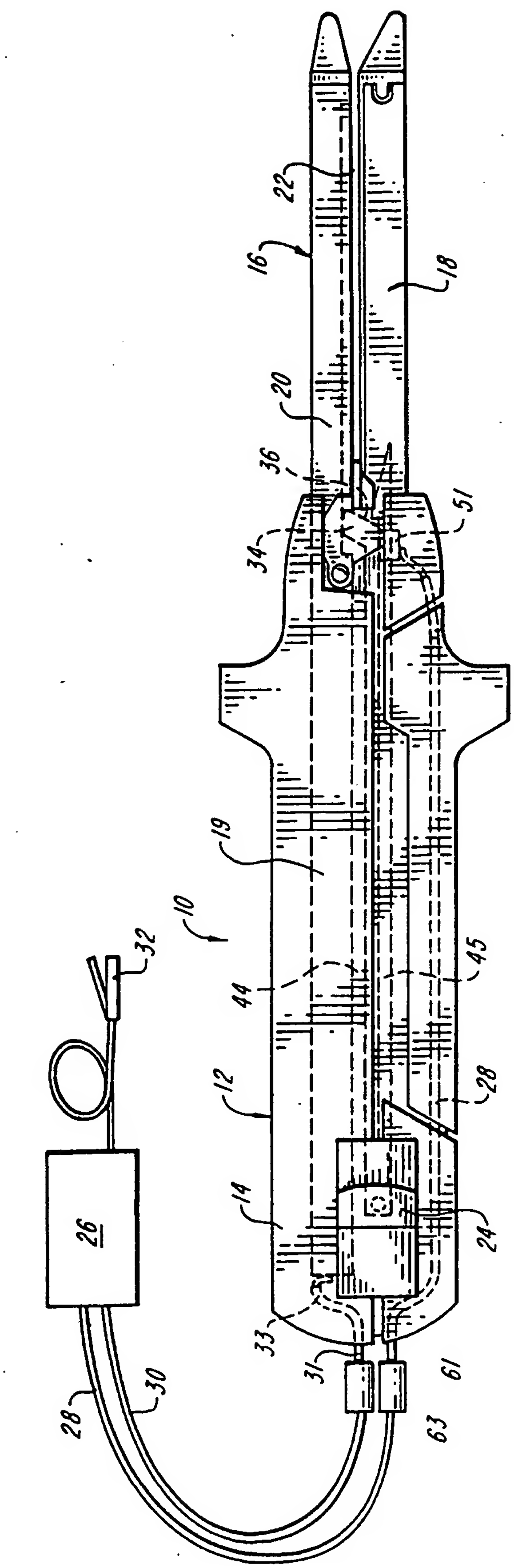


FIG. 1

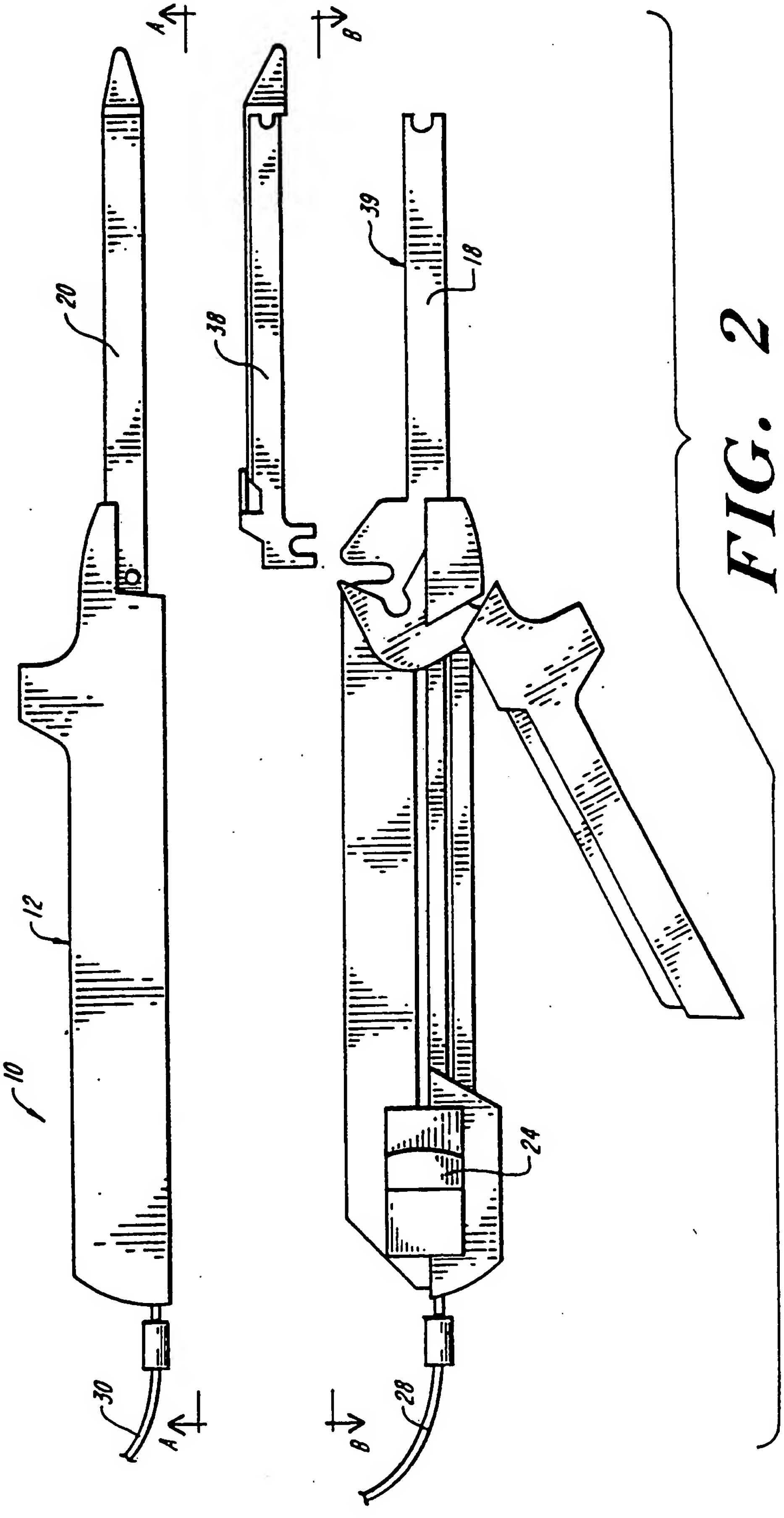
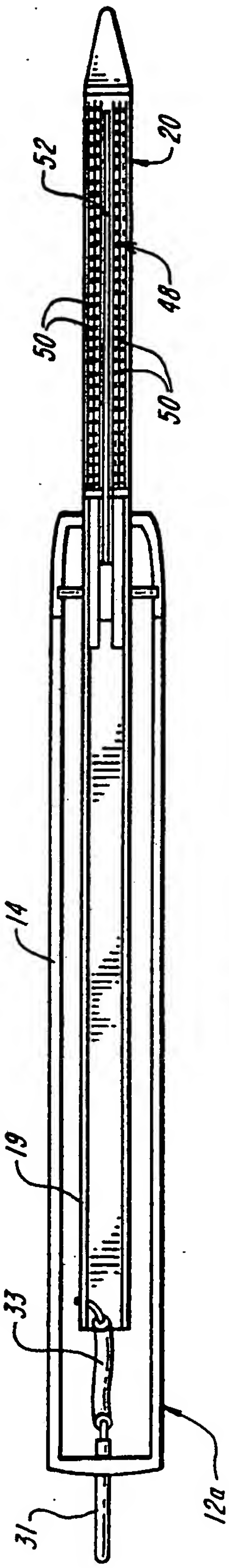


FIG. 2


20
52
48
50
50
14
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33
12a
31

FIG. 4

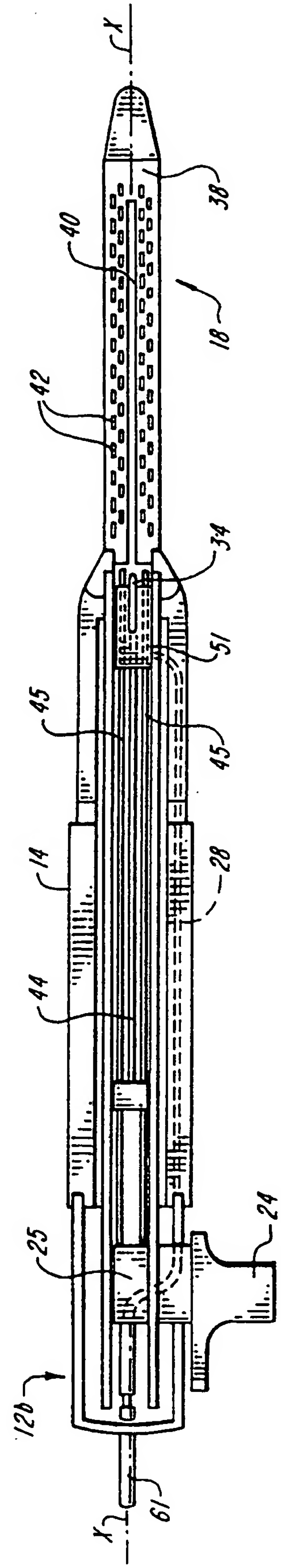
X
38
40
18
42
34
51
45
45
14
28
44
24
25
12b
61
X

FIG. 3

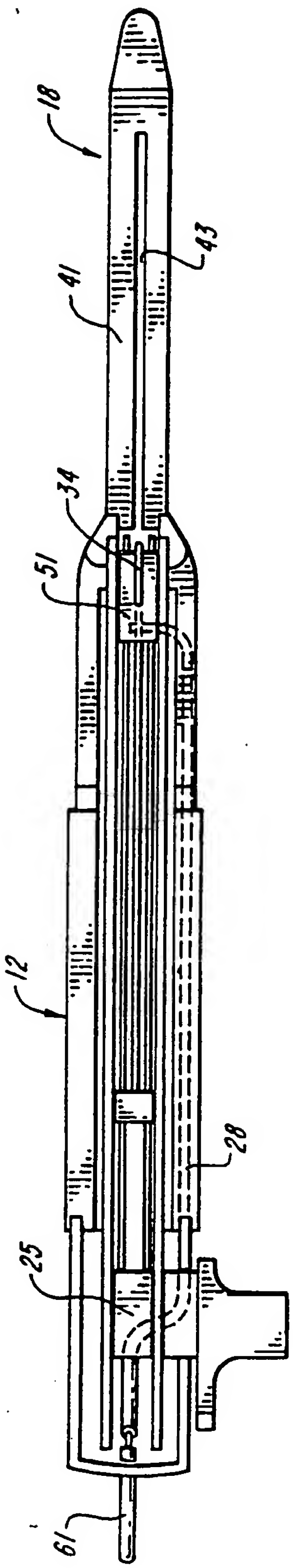

FIG. 5

INTERNATIONAL SEARCH REPORT

PCT/US92/08776

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A61B 17/36
US CL :606/37
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 606/37 606/139,171,38,45,49,142,143,170

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US,A, 1,881,250 (Tomlinson) 04 October 1932 See the entire document.	14,23 14,20-23
A	US,A, 4,784,137 (Kulik et al.) 15 November 1988 See the entire document.	1-27
A	US,A, 4,815,465 (Aluarado) 28 March 1989 See the entire document.	1-27
A	US,A, 4,334,539 (Childs et al.) 15 June 1982 See the entire document.	1-27
A	US,A, 3,952,748 (Kaliher et al.) 27 Arpil 1976 See the entire document.	1-27

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be part of particular relevance

"E" earlier document published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 JANUARY 1993	10 FEB 1993

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